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Kinematics and shear heat pattern of ductile simple shear zones with 'slip boundary condition': application in Himalayan tectonics

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Extrusion by Poiseuille flow and simple shear has been deciphered from large hot orogens, and partial slip boundary condition has been encountered in analogue models. Velocity- and shear heat profiles are deduced for simple shear together with extrusive Poiseuille flow and slip boundary condition for Newtonian viscous rheology. A higher velocity at the upper boundary of the shear zone promotes higher slip velocity at the lower boundary. The other parameters that affect the slip are viscosity and thickness of the shear zone, and the resultant pressure gradient that drives extrusion. In the partial slip case, depending on flow parameters (resultant pressure gradient, density and viscosity) and thickness of the shear zone, the velocity profiles can curve and indicate opposite shear senses. The corresponding shear heat profiles can indicate temperature maximum inside shear zones near either boundaries of the shear zone, or equidistant from them. The developed model is applicable for extrusion of the Greater Himalayan Crystallines. Guo and Wilson (2012; Gondwana Research 22, 360-376) deciphered influx of fluids into the GHC across its lower and southern boundary: the Main Central Thrust from Lesser Himalaya at south. This suggests that slip boundary condition might have prevailed at the MCT during the extrusion of the GHC by Poiseuille flow and/or simple shear. Full version as:

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